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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

NEW APPLICATION FOR LETTERS PATENT

Title: HEAT-REGULATING CONTAINER FOR ATMOSPHERE CONDITIONING SYSTEMS

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FIELD OF THE INVENTION

A temperature or heat regulating container having a built-in structure to control temperature within the container, the container used as a reservoir in conjunction with heating apparatus to achieve controlled release of volatile active ingredients, such as pesticides, disinfectants and fragrances, for any type of atmosphere conditioning systems.

BACKGROUND OF THE INVENTION

Mosquitoes and other insects can be more than a simple nuisance, as they are vectors of deadly diseases like Dengue, Haemorrhagic fever, Malaria, Yellow fever, and various types of Encephalitis. Protecting one's self and family from these diseases is, thus, a premium concern. Devices that repel and kill mosquitoes abound in the market place. There are three basic types of anti-mosquito devices: aerosol insecticides, coils, and electrical devices like mats and emanators.

Aerosols dispense oil or water based, insecticide containing droplets into the air which impact on the mosquito, delivering the insecticide and killing the insect. These droplets impact on

the mosquitoes and either repel them or kill them depending upon how many droplets the insect such as a mosquito encounters. Aerosols are effective for a period of time from between about a few minutes to about a few hours.

Coils are typically composed of pressed sawdust impregnated with a small amount of insecticide. The coil is lit with a match and begins to smolder slowly. As it smolders, the heat evaporates the insecticide into the air as a vapor where it quickly cools and forms micron sized droplets.

Electrical devices like mats and emanators use electrical heat instead of smoldering sawdust. Mats are often composed of an insecticide and a carrier or solvent impregnated into cotton linter that are placed on small metallic heating plates or trays which drive off the active ingredient into the air in the same manner as the coils. Mats can last from between about 4 to about 15 hours.

Emanators work much the same way, but they use a liquid reservoir which contains insecticide and a carrier solvent. The insecticide is carried up to the heating element by a wick, usually ceramic. Because the reservoirs are large, emanators can last up to 90 days.

Electrically powered flying insect killers, like other emanator devices have been growing in popularity for some time. Emanators are preferred over aerosols because of, *inter alia*, the convenience of longer operating times without re-spraying or re-charging, and their odorless operation. They are safer than coils, with their drastically reduced fire risk, and cleaner because there are no messy ashes or smoke to deal with. They are typically perceived of as more modern, upscale products, preferred over seemingly low-tech coils and aerosols.

An improvement over the above mentioned devices is described in co-pending U.S. Patent Application Serial No. 470.136, issued to Schiavo et al, which describes a method for the metered delivery of an insecticidal liquid where the liquid is ejected in small quantities from a bubble-jet type device, without utilizing the traditional methods of heat. By passing the ejected droplets through a static field they can be imparted with a charge attractive to the insects cuticle, attracting them to the insect at room or ambient temperature.

It is known in the prior art to impregnate a solid porous mat with a volatile material, or to place a volatile material in a pan-like metal structure. These mats and pans are placed on heaters to cause the volatile material to vaporize into the atmosphere. U.S. Patent No. 4,439, 415 is a general discussion of heater units used for this purpose. This patent is incorporated herein by reference in its entirety, as if fully set forth herein.

A problem with such metal pans is that for typical heaters they cause the volatile material to be exposed to too much heat. This causes the volatile material to be used up too fast or to degenerate or decompose prematurely, particularly during extended usage.

Mats have similar and significant problems with respect to being exposed to different temperatures across the mat surface. In this regard, low-cost, existing heaters often have hotter regions at certain points along their burner surface, resulting in hot spots and cool regions. The mats therefore have somewhat inefficient vaporization.

These problems are of increased concern for products designed for use for a week or more. Merely adding additional volatile material does not adequately address the problem as prolonged

exposure of volatile materials to high temperatures wastes or is otherwise an inefficient use of the volatile materials.

Another design consideration is that existing heaters, for safety and other reasons, often only accept mats or other inserts having a small cross-sectional shape so that they can fit into a small heater opening. Utilizing a low profile opening is safer and avoids safety risks when operating in households or other areas where children may be prone to play with such devices Thus, the parameters of any solution to the above problems need to take into account these overall size restrictions for such containers.

FIG. 1 shows a lover view of a container **100** of the prior art. FIG. 1 shows a type of container **100** of the prior art with a reservoir for volatile materials used for this purpose. It is sold by S.C. Johnson & Son, Inc. under the trademark FUYI VAPE. This product is described in International Application No. WO 00/67574, by Flashinski et al. The device **100** has a reservoir **106** which contains the volatile material. An insulating pad **104** surrounds the reservoir **106** for controlling the temperature and rate of dispensing of volatile materials contained in the reservoir **106**. The container **100** is held at handle portions **102** and inserted into a suitable opening in a small heating device The insulating pad **104** insulates the volatile material in the reservoir **106** from direct exposure to heat. However, the insulating pad **104** is made of a different material than the reservoir **106** itself, it must be applied to the reservoir **106** in additional manufacturing steps, and can come loose inadvertently or be removed unintentionally which would either interfere with or eliminate completely the benefit of the insulating pad **104**.

As such, it can be seen that a need exists for an improved volatile material dispensing

container for use in conventional or specialized heater devices.

SUMMARY AND ADVANTAGES

A temperature regulating system with a container having structured legs to incorporate a built-in air insulation between a heating apparatus and the container as one unit in order to achieve desirable temperature for the controlled release of active ingredients such as pesticides, disinfectants and fragrances contained in the reservoir of the container, the system being used for the efficient conditioning of the atmosphere in a room.

One object and advantage of the present invention is to provide an integral metal or other heat-resistant material container which incorporates an insulating air gap.

Another object and advantage of the present invention is to provide the air gap created as part of the container structure. Designs which integrate the air gap have a minimum of one (1) or two (2) legs, or more, such as at four (4) corners of a tray or pan-type reservoir, or in a zig-zag design across the lower portion of the reservoir, or other pattern design.

A further object and advantage of the present invention is to provide a system which allows for control within any desirable range of the rate of release of volatile active materials. In a preferred embodiment this can be achieved by varying the length of the legs of the container, i.e., by varying the size or volume of the air gap.

One object and advantage of the present invention is to provide a container made of one or more types of thermally conductive materials such as metal, etc. In a preferred embodiment of the

present invention, an aluminum container is used which provides an efficient and economic means to regulate temperature.

A further object and advantage of the present invention is to provide a support between the reservoir of the volatile material and the hot surface of the heater unit and results in a temperature step-down between the hot exposed surface and the contacting surface of the reservoir.

A further object and advantage of the present invention is to provide an air gap integrated into the design of the metal structure which will serve to spread heat more uniformly across the lower surface of the reservoir of the container. This leads to more efficient use of expensive volatiles as well as reduces degradation due to exposure to excessive temperature over prolonged periods. As a result, inserts can be designed for use for a week, a month, or several months.

One object and advantage of the present invention is that the volatile material is selected from the group consisting of insecticides, insect repellents, fragrances, and deodorizers. The volatile or otherwise active material which is to be dispersed into the atmosphere can be in the form of a liquid or gel composition. A solid substrate (such as cellulose) may be positioned in the reservoir, with the substrate being impregnated with the volatile material.

A further object and advantage of the present invention is the cost-effectiveness of the design. Mats of this type are often used in countries that have very modest average annual incomes. To have much practical application in those countries, the mats must be inexpensive.

Numerous other advantages and features of the present invention will become readily

apparent from the following detailed description of the invention and the embodiments thereof, from the claims and from the accompanying drawings. The claims should be looked to in order to understand the full scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is illustrated in greater detail below with the aid of an example which is represented schematically in:

FIG. 1 shows a lover view of a container **100** of the prior art.

FIG. 2A is a representative view of the heater device environment and apparatus **200** in which the heat-regulating container of the present invention is used.

FIG. 2B is a representative view of an alternate embodiment of the heater device environment and apparatus **200** in which the heat-regulating container of the present invention is used.

FIG. 3 is an upper, perspective view of a preferred embodiment of the heat-regulating container **300** of the present invention.

FIG. 4 is a lower perspective view of a preferred embodiment of the heat-regulating container **300** of the present invention.

FIG. 4A is a lower perspective view of an alternate preferred embodiment of the heat-

regulating container **400** of the present invention.

FIG. 5(a) is a section view of a preferred embodiment of the integral support structure **502** of the heat-regulating container **300** of the present invention.

FIG. 5(b) is a section view of another embodiment of the integral support structure **502** in a zig-zag pattern of the heat-regulating container **300** of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The description that follows is presented to enable one skilled in the art to make and use the present invention, and is provided in the context of a particular application and its requirements. Various modifications to the disclosed embodiments will be apparent to those skilled in the art, and the general principals discussed below may be applied to other embodiments and applications without departing from the scope and spirit of the invention. Therefore, the invention is not intended to be limited to the embodiments disclosed, but the invention is to be given the largest possible scope which is consistent with the principals and features described herein.

It will be understood that in the event parts of different embodiments have similar functions or uses, they may have been given similar or identical reference numerals and descriptions. It will be understood that such duplication of reference numerals is intended solely for efficiency and ease of understanding the present invention, and are not to be construed as limiting in any way, or as implying that the various embodiments themselves are identical.

FIG. 2A is a representative view of the heater device environment and apparatus **200** in which the heat-regulating container of the present invention is used. FIG. 2B is a representative view of an alternate embodiment of the heater device environment and apparatus **200** in which the heat-regulating container of the present invention is used. The typical device **200**, as shown in FIG. 2A, has a side opening **218** allowing for insertion therein of a heat-regulating container (not shown) of the present invention. The heating apparatus **200** can be any appropriate or suitable electric or other type of emanator or heater, as described above. In a preferred embodiment, the electric heater device **200** is an electrical-resistance heater, and has a flat, upwardly exposed hot surface or heating plate **212** adjacent to which is placed the improved container device **300** of present invention. An electrical connector **206** supplies power to an electrical resistor element (not shown) which creates the hot surface **214**. It will be understood that the heater device **200** can also be battery-operated. As shown, safety panels **208** are provided. These safety grid or panel structure **208** can be fixed or, optionally, adjustably oriented to direct the emanating volatile material **308** to any desired direction.

As described herein, the heat-regulating container device **300** of the present invention is adapted for use with a wide variety of electrical and non-electrical heaters **200** available for heating conventional and specialized mosquito mats. It will be understood, however, that the heater device **200** can be replaced by any conventional or specialized, positive temperature co-efficient, or other sources of heat, such as contained flame or catalytic combustion, or other heating means which may be known in the art.

FIG. 3 is an upper, perspective view of a preferred embodiment of the heat-regulating container **300** of the present invention. The container **300** comprises reservoir portion **302** in the central portion of the container **300**. The reservoir **302** contains the volatile material **308**. The

container **300** has gripping tabs or other handle means **304** on either end of the container **300**.

The volatile material **308** can be any one or combination of insecticides and insect repellents, and/or other active agents. Particularly preferred are organic phosphorous insecticides, lipidamide insecticides, natural repellents as citronella oil, natural pyrethrins ad pyrethrum extract, and synthetic pyrethroids. Suitable synthetic pyrethroids are allerbrin as Pynamin, d-allethrin as Pynamin forte, benfluthrin, bifenthrin, bioallethrin, S-bioallethrin, esbiothin, esbiol, bioresmethrin, cycloprothrin, cyfluthrin, beta-cypermethrin, cyphenothrin, deltamethrin, empenthrin, esfenvalerate, fenpropathrin, fenvalerate, flucythrinate, tau-fluvalinate, kadethrin, permethrin, phenothrin, prallethrin as ETOC, resmethrin, tefluthrin, tetramethrin, transfluthrin, or tralomethrin.

Deodorizers, such as a terpene based deodorizer fragrance may also be used in the reservoir portion **302** of the container **300** of the present invention. Further, volatile fragrances, disinfectants, or other air quality modifying agents may be used, such as glycols, trimethylene, and dipropylene. In addition, organic acids that are compatible with the use of the substrate and the atmosphere can also be utilized.

It will be understood that a flexible, transparent or semi-transparent, colored or otherwise opaque, permeable or semi-permeable or other type protective and retaining film or membrane **306** may be used to cover the reservoir **302**. The membrane **306** or other volatile material retaining structure or other closure means may be completely impermeable, or may have selective permeability, it may allow vapors to pass selectively, it may be temperature responsive or otherwise. The membrane **306** may retain a fluid, gel, mat, solid, saturated substrate or other form of volatile active material to be dispensed into the atmosphere.

FIG. 4 is a lower perspective view of a preferred embodiment of the heat-regulating container **300** of the present invention. Support legs or other means **402** emanate from and integral with lower surface **404** of the container device **300**. Lower surface **404** is exposed to heat primarily indirectly but also directly through contact between the support leg means **402** and the hot surface of the heating device, shown best in FIG. 2. In a preferred embodiment, the lower surface **404** is comprised of metal or other material with high thermal conductivity, similar to or different than the material of construction of the rest of the container device **300** of the present invention. The height of the support leg means **402** can be varied, thus providing varying degrees of temperature regulation, step-down or insulation, optionally optimized for the type of insecticide or other volatile material **308** being used, the temperature of the hot surface **204** heating device **200**, the rate of delivery desired, etc. The number and pattern of leg support means may vary to achieve the desired results. Any pattern or height of such leg support means **402** can be integrated into the lower surface **404** of the container device **300** of the present invention. An air gap is thus created by the leg support means **402** between the lower surface **404** of the container device **300** and the heating plate **212**. This built-in air space serves as a temperature control means. The leg supports **402** the leg supports can also be in the form of a plurality of individual dimples or bumps, or other suitable heat-regulating structure.

The heat and the amount of volatile material **308** must be sufficient to volatilize insecticidal agent material in amounts sufficient to achieve the desired insect control. The specific rate of delivery of volatile material **308** and amount of heat necessary will depend on the particular chemical or composition of insecticidal material used and volume of air space created by the leg support means **402**, the rest of the lower surface **404** of the container device **300**, and a heating surface **214**.

In preferred embodiments of the present invention, designs integrate an air gap having a minimum of one (1) or two (2) leg support means **402**, or more, such as at four (4) corners of a tray or pan-type reservoir, or in a zig-zag or other pattern design across the lower surface **404** of the container **300**.

FIG. 4A is a lower perspective view of an alternate preferred embodiment of the heat-regulating container **400** of the present invention. In this embodiment of the present invention, a 2-dimensional series or pattern of leg support means **402a** across the lower surface **404a** of the container **400** provides the enhanced utility and function of the present invention. It will be understood that the leg support means **402a** can be stamped or punched into the lower surface **404a** of the metallic or other suitable material containers **400**.

Additionally, it will be understood that any desired pattern of leg support means **402a** can be used, and that while the lower surface portion **404a** shown in FIG. 4A shows the entire surface **404a** covered with such leg supports **402a**, the leg supports **402a** could similarly be positioned in discrete strips, swathes, or other patterns over the lower surface.

FIG. 5(a) is a section view of a preferred embodiment of the integral leg support structure **502** of the heat-regulating container **300** of the present invention. FIG. 5(b) is a section view of another embodiment of the integral support structure **502** in a zig-zag pattern of the heat-regulating container **300** of the present invention.

FIG. 5(a) shows a container device **300** which has two or more leg support means **502** supporting the container device **300** with reservoir **302** for containing volatile material **308**. The

height of the leg support means **502** regulates heat transfer between the lower surface **404** of container device **300** by defining the size or volume of air space **508**. FIG. 5(b) shows an alternative embodiment of the container device **300** such as shown in FIG. 3 with a zig-zag pattern of the leg support means **502**.

It will be understood that the integral leg support means **402** and **502**, as shown in FIGS. 4, 5(a) and 5(b) can be integrally molded into the lower surface of the container device, if the container device **300** is constructed of a plate or sheet metal the support leg extrusions can be stamped, pressed, rolled, crimped, or otherwise formed directly onto the lower surface **404 of** the container device **300**. Leg support structure **402** or **502** or other similar means with essentially any level of thermal conductivity can also be manufactured or formed independently and then adhered or otherwise coupled directly to the lower surface **404** of the container. In this case, the bond or adhesion layer becomes the integral junction between the leg support means **402** and **502** and the lower surface **404** of the container device **300** of the present invention.

Experimental Data

The following Table 1 provides experimentally obtained data directly correlating support leg means **402** height with temperature as measured at the lower surface **404** of the container device **300** of the present invention.

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Leg Height (mils)	Surface Temperature (F)
0	165
4	140
6	135
8	130
10	127
12	125
14	121
16	118
18	115
20	113
24	109

Table 1 - Experimental Support Height/Surface Temperature Correlation Data

It will be understood by the foregoing supporting description and data that the operating parameters of the container device **300** of the present invention for controlled delivery of volatile or other evaporative agents into the atmosphere can be selected and integrated into the design of the device **300** precisely and independently, as desired.

Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. Although any methods and materials similar or equivalent to those described can be used in the practice or testing of the present invention, the preferred methods and materials are now described. All publications and patent documents referenced in this application are incorporated herein by reference.

While the principles of the invention have been made clear in illustrative embodiments, there will be immediately obvious to those skilled in the art many modifications of structure, arrangement, proportions, the elements, materials, and components used in the practice of the invention, and otherwise, which are particularly adapted to specific environments and operative requirements without departing from those principles. The appended claims are intended to cover and embrace any and all such modifications, with the limits only of the true purview, spirit and scope of the invention.

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